Space Weather Forecast

Issued on Thursday, 30 March 2023 at 12:09 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

---

Space Weather Forecast Headline: Chance of both Minor/Moderate Radio Blackouts and Minor Geomagnetic Storms to end current week. CME(s) pending assessment.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been moderate over the past 24 hours, with occasional Moderate-class flares observed, peaking with a mid-ranking Moderate flare at 30/0737UTC from the largest and most active group on the Sun, now nearing the southwestern solar horizon. This event produced a Coronal Mass Ejection (CME), which is now becoming visible on satellite imagery and will be analysed in due course, however tentatively it lies quite far ahead of the Earth in the track of its orbit for any Earth-based geomagnetic effects. In terms of precursor activity, the same spot also produced earlier Moderate flares at 29/1407UTC, and 29/2346UTC. This group was one of eight surviving on the Sun by the period's end, and was undergoing apparent areal decay at this time in its central regions especially, however the narrowing viewing angle is now very likely hiding developing detail.

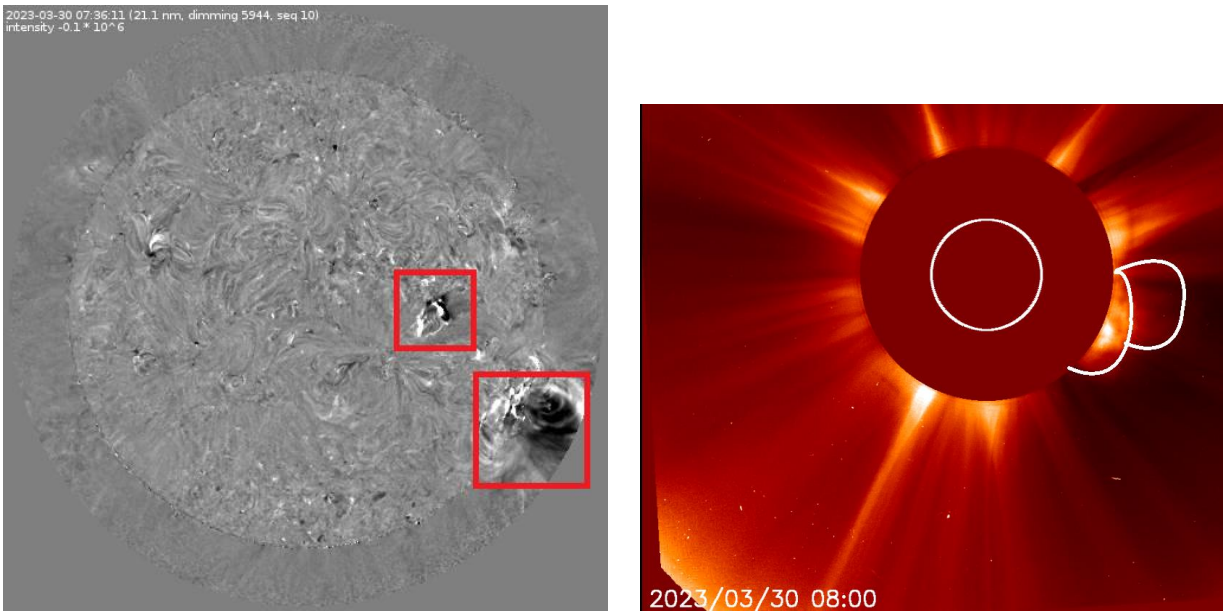

Figure 1: Footprints of possible CMEs left on the solar corona in flase-colour time integrated extreme UV satellite imagery, shown boxed red. These consist of the moderate class flare event on the southwestern solar horizon, but perhaps also a second smaller event at 30/0720UTC nearer centre-disc. It is possible both are now showing on coronagraph imagery (right) and will be analysed in due course. Image processing courtesy of SIDC ROB.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

At the very start of the 24-hour reporting period, a large 'prominence' (arc of plasma) lifted, peaking around 29/1230UTC. The resultant ejecta has been analysed and shows no Earth-directed component. Also of note was a possible small CME from near the solar equator around 30/0720UTC. This feature may just be discernible on imagery before it becomes swamped by the later and larger Moderate X-ray flare event. This will be analysed should imagery allow.

At the time of writing, no Earth-directed CMEs feature in the forecast, with the caveat that the Moderate-class CME and the event immediately prior have yet to be analysed.

Solar Wind / Geomagnetic Activity: The solar wind was initially typical of a slow regime, with a transition into either the precursor shock ahead of a coronal hole fast wind, else a weak passing CME almost exactly around the turn of the current UTC day.

A small discontinuity in many solar wind measures was observed at 29/2359UTC. The solar wind speed was initially slightly elevated, and remained as such but with a jump into the higher parts if the range around 00UTC and remaining here thereafter. The number of particles in the solar wind started at background, but rose slightly with time, with the gradual nature of this change the main detractor in terms of evidence for any CME. The magnitude of the magnetic field was initially near-background and stable, with a slowly varying co- and anti-aligned component (with Earth's field), becoming dented in the current UTC day before a gradual recovery, all the while becoming more generally anti-aligned with Earth's field.

The net result of the above solar wind measures was for mainly quiet geomagnetic activity, well below Minor Geomagnetic Storm G1 throughout.

Energetic Particles / Solar Radiation: A high energy proton enhancement is now visible in the wake of the 30/0737UTC Moderate class X-ray flare, however thus far the magnitude of the rise is considered modest (and comfortably sub-S1), with 10MeV protons peaking at roughly half a pfu by mid-morning UTC (where S1 is 10pfu).

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity carries a chance of further Moderate-class flares in the next 36 hours or so, most likely from the largest and most active sunspot group on the Sun in the southwest. The risk of further such events should then fall into the coming UTC weekend as this region departs the Earth-facing side.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs currently feature in the forecast. A fast wind regime is due to arrive within the current UTC day, giving a chance of Minor Geomagnetic G1 to end the current UTC week before moderating through the weekend to leave mainly quiet conditions ahead of the UTC day of Monday 03 April.

Energetic Particles / Solar Radiation: Solar radiation levels carry a now-raised slight chance of breaching S1 given recent enhancement and the prospect of the active region responsible remaining in a prone location through this forecast period.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	40	40	10	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	50	25	25
Very Active	R3 to R5 X	No	15	15	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	20	20	15	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.